



October 22, 1999

SPACE CENTER Roundup

VOL. 38, NO. 20 LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEXAS

JSC technology to be showcased at Inspection99

A remarkable new material known as fullerene fibers is just one of the promising new technologies to be exhibited at this year's Inspection99 November 3, 4 and 5.

The result of research from NASA JSC and Rice University scientists, fullerenes are potentially 30 to 100 times stronger than steel yet one-sixth its weight. Only visible using powerful non-optical "probe" microscopes, the fibers' tensile strength surpasses that of any known fiber. At a billionth of a meter in diameter it has electrical conductivity similar to metals and heat conductivity better than almost any other material.

It's these properties that make the fibers attractive as possible high-performance aerospace materials and composites. They also could lead to electronics with 10,000 more transistors on a chip than today's circuits, atomic-scaled mechanical systems or revolutionary energy storage devices.

Possibilities like that are what attract the thousands of business, industry, education and community professionals in exploring space-related technology at JSC's annual Inspection.

NASA-developed tools and breakthroughs to help conquer the challenges of human space flight are put on display during this three-day event. Many of the technologies exhibited at Inspection are available to businesses for improving their own processes or for licensing in the private sector.

Last year, more than 600 requests for further information were submitted by 328 organizations attending Inspection. Forty percent of those indicated a strong interest in licensing, commercializing, applying or using a JSC technology or in establishing a collaborative partnership or agreement with JSC. Popular markets from Inspection98 such as advanced materials, manufacturing, communications, software and medical technologies are just some of the areas that will be featured again at this year's event.

The event affords guests the opportunity to tour JSC facilities, examine new technologies derived from JSC's diverse engineering projects and talk with scientists and engineers about technical challenges.

With more than 270 exhibits planned for this year's Inspection99, organizers anticipate an increased attendance touring NASA's Ellington Field site, the Sonny

Carter Training Facility and the 18 buildings on site that are participating.

"Last year we had a record 2,700 guests from 45 states and 21 countries," said Charlene Gilbert, Inspection99 chair. "By adding more than 60 new exhibits and with the growing popularity of this event, we fully expect to top that this year."

Organizers expect the expanding array of technologies on display this year to help many of the guests find solutions to their challenges or pique their interest in promising technologies that may be suitable for commercialization.

Past Inspections led to the commercial development of the Multi-Quick Connector for the offshore petroleum industry, an innovative Echocardiography Laboratory at the Texas Children's Hospital modeled after Mission Control, and an axial heart pump designed in partnership with the Baylor College of Medicine.

Attendance at Inspection has grown every year, and to keep that trend going, organizers are reaching out to new markets, some of which are neighbors to JSC.

"This year we are focusing much more on attracting industry and high-level educational establishments, such as colleges and universities," added Gilbert. "We really want our local petroleum, information technology and manufacturing businesses to be aware of the resources NASA has available to them and to take advantage of this opportunity to see them firsthand."

Each NASA center will be participating in the event, including many robotics, automation and virtual reality technology exhibits from Ames Research Center. The Commercial Space Centers for Food Technology and Space-based Materials Technology will also be a part of the event.

"The Commercial Space Centers are JSC partnerships with universities to develop various technology specialties," said Gilbert. "Tapping the academic institutes provides NASA with another avenue for promoting commercialization." ■

Employees who would like to get involved with Inspection99 should contact their Directorate Point of Contact for details. Information about Inspection99 is posted on an electronic board accessible from the internal JSC Web site, <http://www4.jsc.nasa.gov/scripts/InspectionDay/JobBoard/index.cfm>



Teachers get inside look at attractions.

Page 3



X-37 passes tests in Neutral Buoyancy Lab.

Page 5



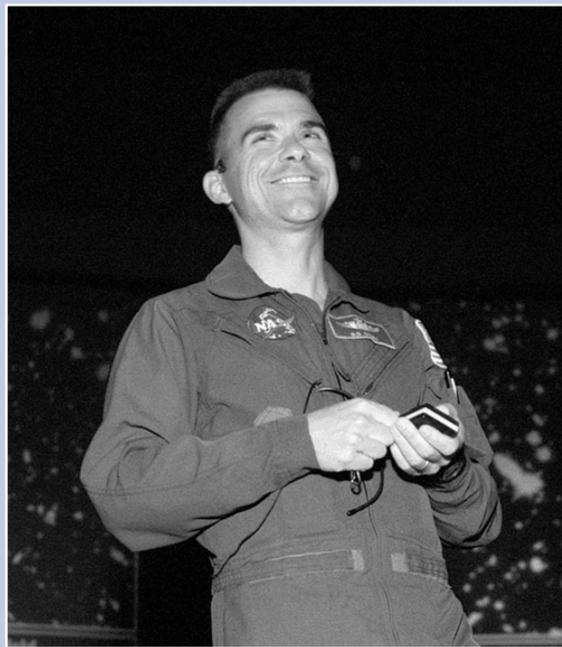
Liberty Bell 7 finally recovered from Atlantic.

Page 7

A few good cadets: candidates camp out at Space Center Houston

Nearly 200 Junior Reserve Officer Training Candidates trooped into Space Center Houston last month for a late night of learning and inspiration. As part of the JROTC School Overnight Program, the high school students and instructors participated in "hands-on" space science activities with various JSC experts and education counselors from SCH.

As a special highlight of the evening, Astronaut Duane Carey spoke to the cadets and stressed that learning is not only applicable in the formal classroom, but is a lifelong skill necessary to be successful throughout



NASA JSC Photo S99-11688 by Bill Stafford

Astronaut Duane Carey talks to cadets as part of the JROTC School Overnight Program at Space Center Houston.

our lives. Carey said as an astronaut he is constantly challenged to learn new things that even a few years ago he had no idea he would need to know.

Carey further complemented his presentation by showing the cadets imagery of their hometowns in Georgia, Louisiana, Mississippi, Oklahoma and Texas as taken from space.

SCH extends special thanks to Paul Hill, Flight Directors Office, John Albright, Energy Systems Division, and Jerry Condon and Ellen Braden of the Aerospace and Flight Mechanics Division for their assistance with the September 24 event. Many JSC employees help with the School Visit Program by giving special presentations and demonstrations at SCH. The SCH Education Department is very grateful for the time and effort they give to support these educational programs. ■

Boeing vice president guest at George M. Low Leadership Series

Be involved with something you care about, stay focused and work as a team – some of the leading points made by Alan R. Mulally, The Boeing Company's senior vice president while addressing JSC leaders at a dinner in late August.

"Everybody wants to be part of something special, part of something really meaningful," said Mulally. "If we, as leaders, can't make our projects meaningful to large numbers of people, then maybe we need to be somewhere else."

Mulally, a 31-year veteran of the world's largest aerospace company, spoke from firsthand experience. As a survivor of the turbulent times at the aviation company, Mulally offered the audience candid advice from his perspective.

Mulally shared his "Paul Harvey" version of Boeing's trials and tribulations of the 90s, explaining that after delivering 446 airplanes in 1992, the company reacted to a plummeting economy and a changing marketplace

in 1995 by producing only 206 aircraft.

"We absolutely lost it," said Mulally. "There wasn't this huge industrial base anymore and we couldn't get parts. We finally had to stop production."

The company charged ahead and recovered by delivering 620 aircraft in 1998.

"There's always a way if you have an attitude that you'll find a way," said

Aviation industry keynote offers JSC leaders advice, insight

At a dead end and faced with airline commitments, the company was at a standstill.

"We went straight through the practices and principles. We got together and figured out what we could do and got a real clean work statement," explained Mulally. "And we communicated that work statement with everyone, all 123,000 employees. I gave them an e-mail update every week. The only way I know to do large-scale projects is to work together."

Mulally. "I knew we could accomplish great things as long as we worked together, but we had to have a shared view about that."

When people see [NASA] it changes their lives – NASA does magical stuff and has a very unique contribution. Everything in the future is going to be so global. How much of the ISS project is about space station? I think it's really much larger than that.

– Alan R. Mulally

Mulally's advice transcended to JSC and its goals.

"When people see [NASA] it changes their lives – NASA does magical stuff and has a very unique contribution," he said. "Everything in the future is going to be so global. How much of the ISS project is about space station? I think it's really much larger than that."

Mulally's visit was part of the George M. Low Leadership Series, a continuing lecture series initiated by JSC Center Director George Abbey to help center leaders learn from government and industry colleagues.

Mulally's address was the sixth such lecture to more than 200 invited guests of center division chiefs, directors and deputy directors. Previous speakers include Skip LeFauve, former president and chairman of Saturn, and Harry Stonecipher, the president and CEO of McDonnell Douglas Corporation. ■



Time for auto safety



By Steve Riley

In today's fast-paced world, quite often we are too busy to deal with those things we sometimes take for granted. One of these is our everyday transportation source, our cars. With several driving holidays fast approaching, be sure to take a few minutes to give your car a quick checkup; the price for your few minutes at home is definitely worth the added safety on the road.

Performing these simple checks will make sure your car purrs like a kitten when you get out on the open road. If in doubt, leave the checks to a professional.

♦ **Tire pressure:** With today's advanced radial tires, you cannot "eyeball" the tires to make sure they have adequate pressure. Most cars require a cold tire pressure of around 30 psi; the tires normally don't show that they are low

until down to 10 or 15 psi. That's a blowout waiting to happen. Also, remember that when the seasons change, your pressure does too; every 10-degree drop in outside temperature is a corresponding drop of a pound of tire pressure. Make sure you check the cold pressure – before you drive.

If a tire is unusually low, it may have a leak – get it fixed. Some service centers fix flats free. While you're down checking the pressure, eyeball the tread of each tire – check that you are getting even wear and have plenty of tread left for your trip.

♦ **Underhood fluid levels:** Unlike tires, most of these should be checked when the car is warmed up, but turned off. Make sure that the oil level is between the hash marks on the dipstick,

and is a golden brown; if it is black, be sure to have the oil changed before traveling. The brake fluid should be well above the "low" point; as brakes wear, the level will drop to compensate. Check the fluid in the radiator's overflow tank – when the car is hot, the tank should be near full. Don't remove the radiator cap when the car is hot. Also check the power steering fluid level, transmission fluid level (which usually requires that the car be running), and the washer fluid level.

♦ **Lights and signals:** Have a friend help you check that all of your headlights, turn signals, brake lights, and reverse lights are functioning properly. The windshield wipers should also be checked and used to ensure they still work adequately.

Drive safely!

♦ **Driver check:** Lastly, give your car a simple driving check. Turn off the radio and fan, and listen for any unusual sounds, or if you feel any funny vibrations or directional instability. If you think you hear or feel something strange, don't be fearful of getting your car checked. An hour spent at a service center is much better than countless hours stranded on the open road.

For proper fluid types and other good information, read your car's owner's manual. Remember – if you have any doubt about these safety checks, they are probably best left to a professional shop. ■

Young receives Nolen Lifetime Achievement Award

By Nicole Cloutier

Capt. John Young, astronaut and JSC's associate director (technical), was awarded the 1999 Lloyd P. Nolen Lifetime Achievement in Aviation Award earlier this month. Announced at a press conference at Ellington Field by the Wings Over Houston Airshow Festival Executive Committee, the award honors Young's substantial contributions to the aviation community throughout his lifetime.

"They're giving this award to me for lifetime achievements, but I'm still working on about 120 or 130 other things," said Young. "We still have a long way to go."

Young has flown in space six times in three different spacecraft. And as he's well known throughout the NASA community for his legendary role as one of the early astronauts, his contributions to the field of flight go far beyond that.

"I feel honored that our organization could recognize someone of such outstanding accomplishments," said Everett Gibson, an airshow volunteer and JSC senior space scientist and co-leader for the Mars Research Team. "Aside from his NASA career, he has been a leader with his aviation work and what he did as a test pilot for the Navy."

After graduating from Georgia Institute of Technology, Young joined the Navy. He underwent training at the U.S. Navy Test Pilot School in 1959 and was assigned to the Naval Air Test Center where he assessed weapon systems on the Phantom and the Crusader. He went on to set world time-to-climb records in the Phantom in 1962.

That same year, Young joined NASA's astronaut program and began his incredible record of space flights starting with Gemini 3. He's the only person to have flown in Gemini, Apollo and space shuttle vehicles.

"Even with these remarkable achievements, he is a very nice person and a humble person," added Gibson. "He always recognizes the people who work to put these programs together. He's been involved in the space program for so long,

yet he still maintains such enthusiasm and inspiration. It's unusual to find all of these qualities in a person."

Upon accepting the award, Young made a point to thank the people who've contributed to his success.

"It's a team effort to be in aviation as long as I have," said Young, who thanked his wife for her support throughout his endeavors. He also thanked the Navy for launching his aviation career. "Were it not

for them [U.S. Navy], I would never have started, and that F-4 back there gave me the chance to get into the astronaut corps."

Since joining NASA, Young has fulfilled a variety of positions including chief of Space Shuttle Branch of the Astronaut Office; chief of the Astronaut Office; and special assistant to the director of JSC for Engineering, Operations and Safety.

The award, first given in 1989, is named for Lloyd P. Nolen, a man immersed in aviation as a pilot, aircraft owner, mechanic, and businessman throughout his life. Noting that thousands of World War II aircraft were being destroyed in the early 50's without any efforts for preservation, Nolen recruited friends in the Rio Grande Valley to acquire the aircraft. By 1957, they formed an organization dedicated to locating, acquiring and restoring as many allied and enemy aircraft as possible. Today the American Airpower Heritage Foundation, located in Midland, Texas, has more than 140 aircraft in its inventory and is one of the finest aviation museums in the country. Nolen was the first recipient of the award given in his name.

The 1999 award will be displayed in the trophy case in the Teague Auditorium. "I'm going to set the trophy up at JSC so the people who really deserve a piece of it can come and look at it," said Young. "All the folks at NASA, they are the people who support this flying operation and have made it probably the best that we have on the continent." ■



NASA JSC Photo S99-11921 by James Blair

Capt. John Young receives the Lloyd P. Nolen Lifetime Achievement in Aviation Award. Presenting the award is Wings Over Houston Airshow Festival volunteer and JSC Senior Space Scientist Everett Gibson.

“My old flight instructor told me, ‘You don’t learn anything by sitting on the ground.’ I think he was right on.

— John Young

Space Center Houston opens doors to teachers

By Nicole Cloutier

Just weeks after JSC opened its doors for a community Open House, our neighbor, Space Center Houston, opened its doors to share an inside look at its attractions. This time to more than 700 teachers from around Texas.

The fourth annual Open House for Educators, held September 23, was designed to give teachers an opportunity to experience SCH's attractions, exhibits and educational resources.

"Not only do we offer daily field trips, we offer school overnight programs, teacher conferences, teacher workshops and a teacher camp-in where the teachers spend the night in our facility," said Laurie Murphey, SCH's educational program specialist. "Our programs and curriculum are designed to help teachers motivate students, using the theme of space to stay in school, take math and science courses, and realize the many possibilities of working in the space program."

That message wasn't lost on this audience. Chris Chilelli, aerospace specialist for the Juan Linn Math and Science Magnet School, was part of a small contingent that drove from Victoria to attend the event. He said he and his group walked away with a greater awareness of the programs available for schools and teachers to participate in.

"It was an outstanding experience and the four of us talked about it all on the two hour drive back to Victoria," said Chilelli. He also said that Astronaut Jim Newman's presentation was particularly inspiring and informative.



NASA JSC S99-11658 by James Blair

Teachers take a spin on some of Space Center Houston's educational exhibits, like this hands-on gyroscopic display, during Open House for Educators.

"His insights and interpretation of living in space were memorable and 'down to Earth' in an amusing yet respectful way," said Chilelli.

Dr. William Staples, president of University of Houston Clear Lake, and Susan Moore Fontenot, Goose Creek ISD, told a filled-to-capacity auditorium about their Baytown Educational Recruitment (BAER) initiative and introduced Erica Edwards, a BAER participant who will graduate from UHCL this December. BAER is a program that provides scholarships and internship opportunities for students aspiring to enter the educational field in an effort to combat the attrition occurring in the profession.

"Half of the teachers in today's classrooms will retire in the next five years,"

said Staples. "Through BAER, University of Houston Clear Lake helps students become teachers."

The teachers were treated to a sneak peek of the new "Are We Alone?" exhibit, an elaborate collection of larger-than-life, animated alien creatures and special viewings of the *On Human Destiny* and *To Be an Astronaut* IMAX productions. ■

“This kind of exposure and awareness, the access to the exploration and adventure by those who work to make the space program work is very valuable to teachers. These are the motivators for us as humans to explore and learn, to solve problems and to become better people.

— Chris Chilelli

Martian meteorite carbonates 3.9 billion years old

By John Ira Petty

A new study of the carbonate minerals found in a meteorite from Mars shows they were formed about 3.9 billion years ago. Scientists believe the planet had flowing surface water and warmer temperatures then, making it more Earth-like. Giant meteorites were blasting huge craters in its surface.

This study doesn't directly address the possibility that life once existed on Mars. But "It's another piece in the puzzle," said Larry E. Nyquist of the Planetary Sciences Branch of JSC's Earth Science and Solar System Exploration Division. Nyquist, one of the authors of an article in *Science*, a weekly publication of the American Association for the Advancement of Science, was the principal investigator.

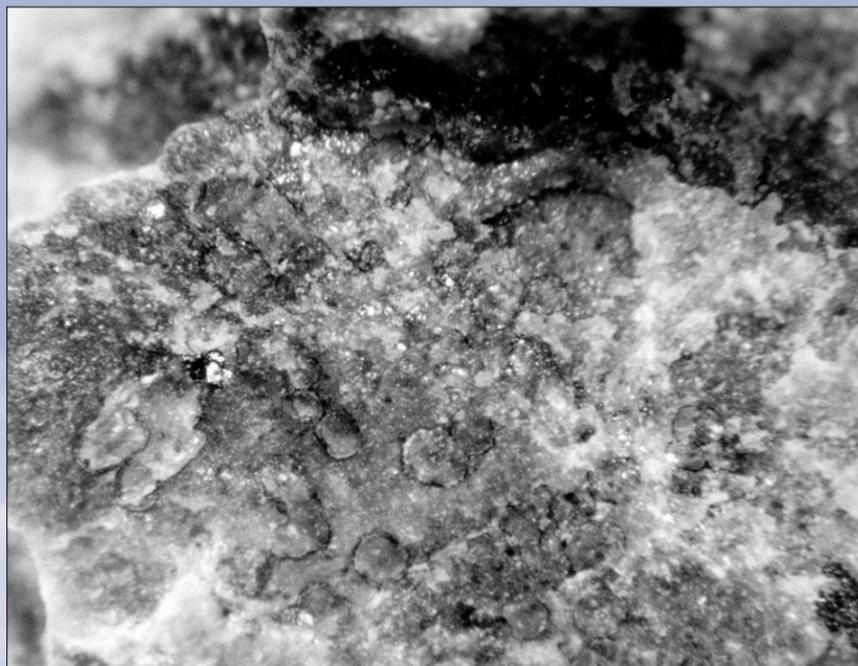
Researchers at JSC and the University of Texas at Austin did the study, using different techniques. Both produced similar results, establishing the carbonates' age within comparatively narrow limits.

The 4.2 pound meteorite is believed to be part of an igneous rock formation formed about 4.5 billion years ago as Mars solidified from a molten mass. The meteorite probably was blasted from the planet when a huge comet or asteroid struck Mars 16 million years ago.

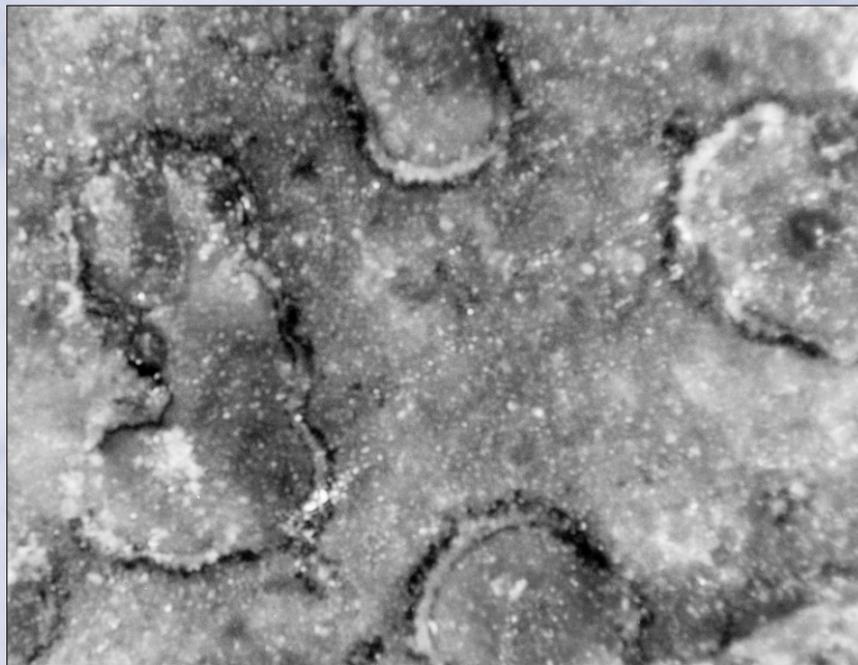
It fell in Antarctica about 13,000 years ago, and was found in 1984 by an annual expedition sponsored jointly by NASA, the National Science Foundation, and the Smithsonian Institution. Called ALH84001, after the Allan Hills in Antarctica where it was found, it was returned to JSC where it has been preserved in the Meteorite Processing Laboratory.

It subsequently was recognized as one of more than a dozen meteorites with unique Martian characteristics.

Just how the carbonates were deposited within this igneous rock is the topic of lively debate. Some scientists believe water saturated with carbon dioxide from the atmosphere seeped down to the subsurface site where the igneous rock formed and created the carbonate deposits. On Earth, living organisms often play a role in carbonate formation. In 1996 scientists at JSC and Stanford



CARBONATES IN SITU—This photomicrograph shows the carbonate minerals in ALH84001 in situ against a background of orthopyroxene, the dominant silicate mineral in this igneous rock. These carbonates are typical of the "globule carbonates" found in ALH84001, although some carbonates with other shapes also are found. At the center is manganese-bearing calcium carbonate, surrounded by iron-carbonate, and enclosed in a layer of magnesium-carbonate. The dark rims surrounding the carbonates are iron sulphides.



CARBONATE-BEARING FRAGMENTS—This photomicrograph shows a few fragments of ALH84001 picked from a portion of the meteorite that was crushed for analysis. The background is the bottom of a beaker in which the fragments were placed for use as a control sample for the age study. Dark sulphide rims are visible on the silicate grains. The large, nearly transparent, grain at the lower right is plagioclase; the others are orthopyroxene. These grains were subjected to the same chemical dissolution procedures as was a much larger sample used for the actual age-dating analysis reported in the *Science* article. The carbonates were slowly and selectively dissolved using progressively stronger dissolution reagents and procedures. The amounts of calcium, iron, and magnesium released during each step were determined and used to verify that carbonates of varying composition were dissolving. Isotopic measurements of rubidium, strontium, uranium, and lead released with the major components determined the age of the carbonates to be 3.9-4.0 billion years old.



ALH84001,0—This photograph was taken during the initial processing of ALH84001. Dull, dark fusion crust covers about 80% of the sample..

“It’s another piece of the puzzle.”

— Larry E. Nyquist

University examined the carbonates in ALH84001 using electron microscopy and laser mass spectrometry, and reported evidence suggesting primitive life may have existed in them.

Other scientists believe the carbonates formed when hot, carbon-dioxide-bearing fluids were forced into cracks in the rocks when a meteor struck Mars. The 3.9-billion-year age of the carbonates eliminates neither possibility.

The carbonates themselves are tiny deposits, reddish globules, some with purplish centers and many surrounded by white borders. The different colors are due to variations in the compositions of the carbonates: purplish manganese-bearing calcium carbonate, reddish iron carbonate, and white magnesium carbonates. The globules were found along fractures in the meteorite and make up about 1 percent of its volume.

The JSC-UT team, using a binocular microscope and tools resembling dental picks, over a period of months painstakingly separated out enough of the carbonate material for their analyses. After experimenting with terrestrial calcium, iron, and magnesium carbonates, they developed a way to selectively dissolve carbonate material of differing compositions, enabling them to separate different elements from the carbonate solutions.

The study established the age of the carbonate deposits by measuring the decay of rubidium to strontium and of uranium to lead. The techniques are similar to carbon dating, which is used for much shorter time periods. The investigators used the dual approach because “we wanted to make sure we had a result we could believe in and that other people could believe in,” Nyquist said.

The leading author of the *Science* article is Lars E. Borg, formerly of the National Research Council and JSC and now at the University of New Mexico in Albuquerque. Other authors are James N. Connelly of the University of Texas at Austin, Chi-Yu Shih, Henry Weismann, and Young Reese of Lockheed Engineering and Science in Houston. K. Manser of the University of Texas contributed to the investigation.

The age of the carbonates, said Everett K. Gibson of JSC and an author of the 1996 study that reported evidence of microbial life in the carbonates, had been “one of the real mysteries” of indications of life on Mars. Had the carbonates been formed more recently, when the planet’s surface was devoid of water, it would have been unlikely they were associated with primitive life on Mars. Dating them at 3.9 billion years, when there apparently was surface water on Mars is, Gibson said, very important, and could “suggest events were very similar in the inner solar system” as primitive life arose. ■

X-37 Space Maneuver Vehicle passes development test at Neutral Buoyancy Laboratory

History was made when a development test for the X-37 Space Maneuver Vehicle was conducted in the Neutral Buoyancy Lab at the Sonny Carter Training Facility. The test was designed to evaluate the X-37's conceptual Extravehicular Activities interfaces to ensure that the design of the vehicle provides for the necessary on-orbit serviceability.

The vehicle tested in the NBL actually represents two programs with very similar vehicles. The X-37 is a Marshall Space Flight Center project

to demonstrate new technology during one or two space shuttle missions. The Air Force SMV is intended to be an unmanned, operational vehicle to carry payloads to orbit and remain there for up to one year. The SMV will have enough fuel capacity to fly around the moon if desired before returning for a runway landing on Earth. The Air Force has completed auto-land testing of an

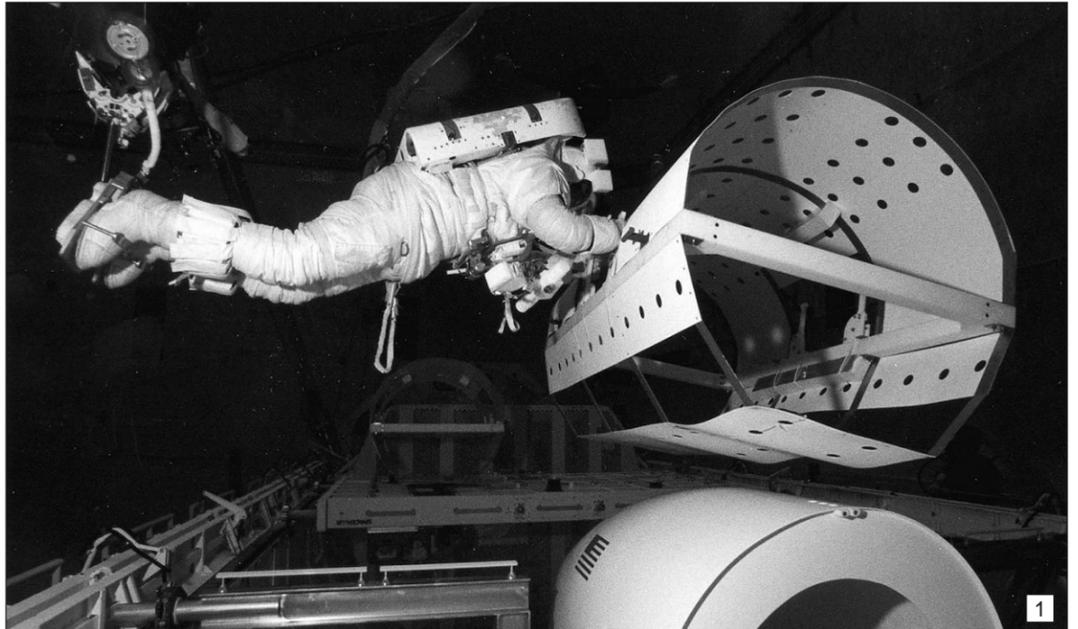
aerodynamic mockup by dropping it from a helicopter. The next phase involves dropping the flight vehicle from a B-52 aircraft before sending it to the Kennedy Space Center for its first shuttle flight. Both vehicles are scheduled to fly aboard the space shuttle in about three years.

"Evaluating the EVA aspects of the X-37 early in the design cycle will help to ensure that the vehicle will be easily serviced by space-walking crewmembers," said Greg Harbaugh, manager, JSC EVA Project Office. "This will result in a significantly improved development track in that late cycle design changes will not be needed to address EVA issues."

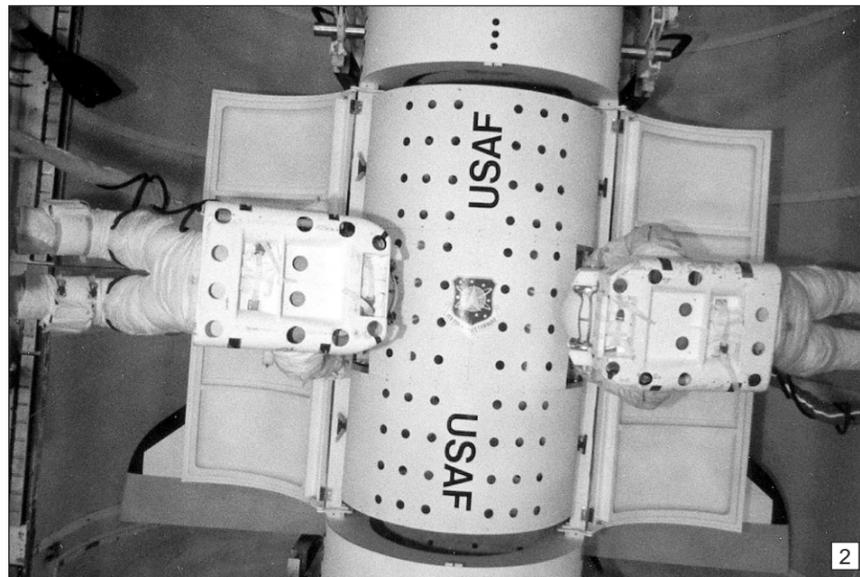
The primary objectives of the test were to evaluate planned and contingency EVAs for refueling and payload changeout for the X-37. Planned EVAs included the use of the

Evaluating the EVA aspects of the X-37 early in the design cycle will help to ensure that the vehicle will be easily serviced by space-walking crewmembers.

— Greg Harbaugh



NASA JSC Photo S99-06094



NASA JSC Photo S99-06090

Shuttle Remote Maneuvering System to access the refueling ports on the X-37 and maneuver payloads from the X-37 cargo bay to the SpaceHab Integrated Cargo Carrier Pallet. Contingency operations assumed that the SRMS was not available and that two crewmembers had to perform the refueling and payload swap from Portable Foot Restraints. These capabilities are important to meet Air Force objectives to fly multiple missions during the same space shuttle flight.

A secondary objective evaluated during the test was access for the contingency release of the Payload Retention Latch Assemblies and locations for Cradle EVA interfaces. This objective verified that the EVA crew could access and manually open the motor-driven latches that hold the X-37 SMV into the orbiter during launch. The Cradle is the structure between the orbiter and the X-37 SMV. The design of the Cradle was not evaluated during the test except to demonstrate access to latches.

The test was successfully completed with all of the planned objectives evaluated. The test provided a wealth of information on X-37 EVA operations. Boeing designers in Seal Beach, Calif., will use this data to design both the X-37 and the Air Force SMV.

An X-37 NBL mockup constructed almost entirely from fiberglass was used for the test. The aluminum Cradle was a conceptual representation of the hardware needed to secure the X-37 in the shuttle payload bay. Two plastic payload mockups representing the maximum volumetric payload capacity of the X-37 were also used. Each test article was configured to simulate the anticipated flight configuration as closely as possible given existing mockup limitations.

EVA servicing tasks for the X-37 were conducted during the 3-day investigation, with each test run scheduled as a 4-hour space walk. All subjects evaluated all of the tasks during each run. Each subject evaluated the X-37 refueling and payload changeout operations both with and without the SRMS. In addition, access to the PRLAs was evaluated for the contingency release of the X-37 from the orbiter.

Test subjects were Arne Aamodt from the Mission Operations Directorate and astronauts Carl Walz, Dave Wolf, Michael Anderson, Michael Fincke, Mark Lee and Susan Helms.

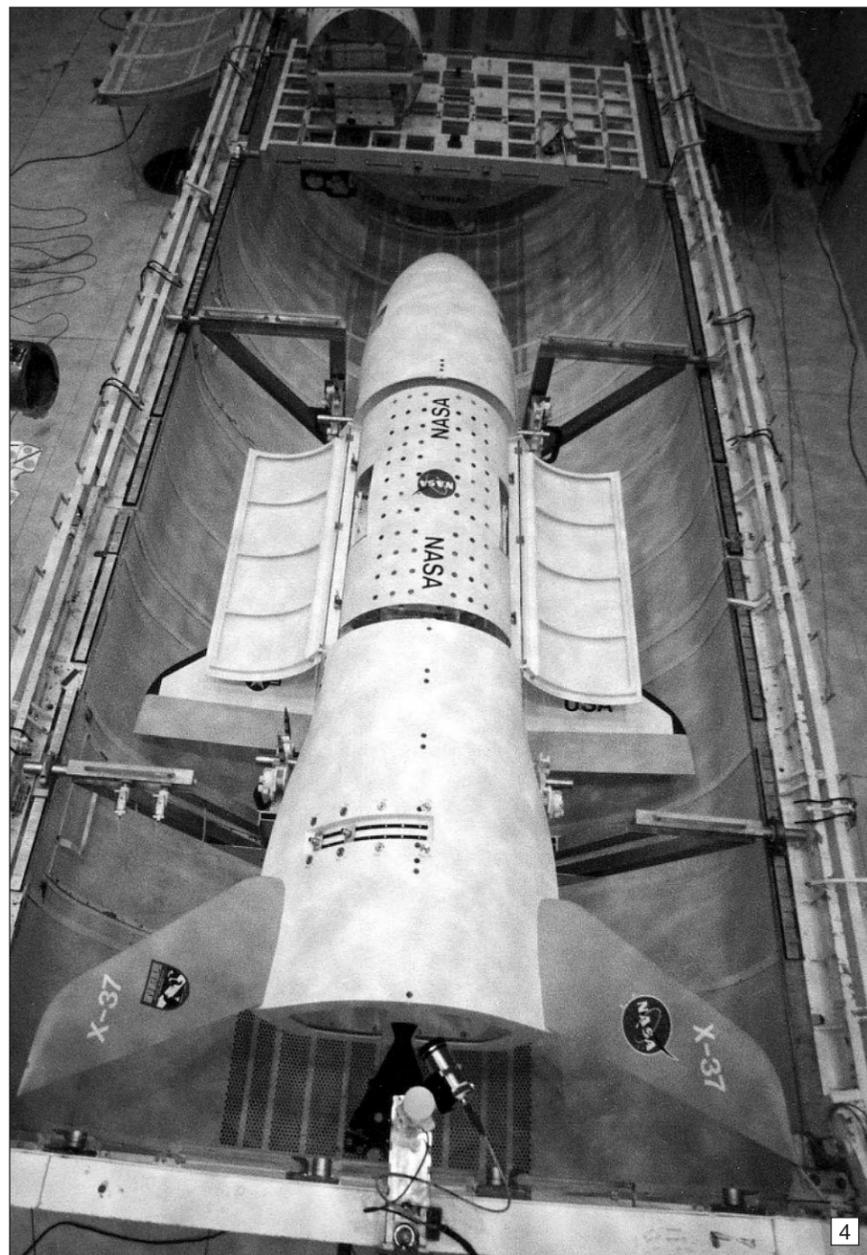


NASA JSC Photo S99-06083

- 1 A crewmember checks out payload maneuvering with the Shuttle Remote Maneuvering System.
- 2 Crewmembers go through the payload installation sequence.
- 3 A crewmember checks out access to the Payload Retention Latch Assemblies for contingency manual release.
- 4 This photo shows the configuration of the test articles. Each test article was configured to simulate the anticipated flight configuration as much as possible given the existing mockup limitations.

load development allows the whole NBL test team to provide the most value," Wolf said. "It reduces future design changes and enhances the final product. It is exactly what we like to see."

The evaluation was coordinated and conducted by the Lockheed Martin Space Operations Test Implementation and Core Test Support Group, part of the Crew and Thermal Systems Division at JSC. Other JSC organizations participating were the Mission Operations Directorate and the Flight Crew Operations Directorate. Both support the EVA Project Office and EVA Analysis and Integration Team in overseeing the test and evaluation of EVA hardware. Contractor personnel from Schafer Corp. and Muniz Engineering also helped with the test. ■



NASA JSC Photo S99-06068

Ripped from the ROUNDUP

Ripped straight from the pages of old Space News Roundups, here's what happened at JSC on this date:

1 9 6 4

The Manned-Spacecraft Center – Florida Operations at the Merritt Island Launch Area (MILA) concluded October 18 the installation of pyrotechnics and weight and balance tests at the industrial area on the Gemini Titan GT-2 spacecraft. The GT-2 launch is slated for the last quarter of this year, and will be the first and only ballistic flight of the Gemini program. It will preface the two manned orbital flights scheduled for the first quarter of 1965.

1 9 7 4

Dr. James C. Fletcher, NASA administrator, announced that the first few space shuttle development flights will return from space to NASA's Flight Research Center, Edwards, California.

"We plan to make the first horizontal flight tests of the Shuttle orbiter, launched from a 747 aircraft, at NASA's Flight Research Center at Edwards (Air Force Base)," said Fletcher. In addition we plan to use Edwards as a secondary landing site for operational Shuttle flights when weather or other considerations make it desirable."

1 9 7 9

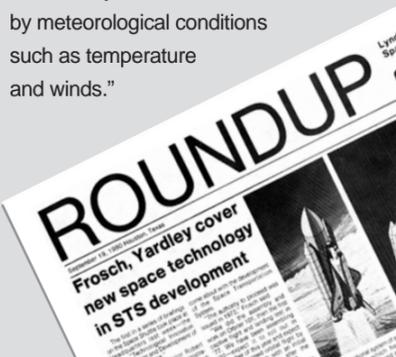
The Pegasus Two spacecraft assembly, launched by NASA in 1965, will re-enter the Earth's atmosphere on or about November 5.

Pegasus Two was one of three satellites used to gather micrometeoroid data for use in design of spacecraft. Re-entry heat will destroy 9705 kg. (21,400 lb.) of orbital hardware which means about 726 kg. (1600 lb.) may survive re-entry in several pieces.

1 9 8 9

Continuing satellite observations have confirmed that the ozone hole over the Antarctic this year has equaled the record-setting hole observed in 1987, NASA scientists said last week.

"It's becoming clear that the ozone hole is not going away in the near future," said Dr. Arlin Krueger, the principal investigator. "The depth of the ozone hole each year will be determined by meteorological conditions such as temperature and winds."



JSC to kick off Combined Federal Campaign 'Working Together-For a Better Tomorrow'

JSC officially will kick off the annual Combined Federal Campaign on October 25, establishing a goal of \$510,000 for 1999.

The theme for the Texas Gulf Coast CFC, of which JSC's efforts are a part, is "Working Together – For a Better Tomorrow." The JSC campaign will run through December 3.

The CFC was established by executive order in 1961 to provide a single charitable fund-raising campaign within the federal community. Except for relief drives and emergency disaster appeals, the CFC is the only authorized on-the-job charitable fund-raising campaign for federal civilian, military, and postal service employees. The CFC gives JSC employees the opportunity to contribute to local, national, and international health and welfare charities. The Office of Personnel Management establishes the regulations governing the CFC including the charities that participate in the campaign.

There are more than 1,500 charitable organizations in the Houston CFC. These

Center's goal is \$510,000

agencies are listed in a brochure that will be available online and copies will be available from each organization's coordinator. Employees may direct their contributions to the charitable organization(s) of their choice by listing the agency code on their pledge forms along with the dollar amount they wish to give to that charity.

JSC employees may participate through payroll deduction by specifying an amount to be withheld every payday that will continue throughout the year. Deductions for pledges made during this campaign will begin in January 2000. Payroll deduction is a convenient way to give and is much easier on family budgets.

Last year, JSC employees and retirees gave more than \$514,000 of the

\$2.6 million contributed by federal employees throughout the Houston area. This year, the CFC goal is \$3 million.

JSC CFC Coordinator Teresa Sullivan said there are some interesting incentives this year for employees who pledge one hour's pay or more. Those who pledge one hour's pay per month will receive a CFC lapel pin. Those who pledge two hours' pay will receive a lapel pin and a compact disc holder. Those who pledge \$600 or more per year will receive a lapel pin, badge lanyard, and a personalized certificate of appreciation signed by a prominent Texan.

In addition, those employees contributing one hour's pay per month or more will be eligible for a drawing for five three-month reserved parking spaces. The drawing will be held at the conclusion of the campaign. ■

For further information, contact your organization's coordinator or Sullivan at x31034.

'Rocket Boys' Author Homer Hickam returns

By Jeff Peters

Homer H. Hickam Jr. summarized his childhood and career to a capacity crowd at University of Houston-Clear Lake's main auditorium on September 25. However, there was more than what has happened in his life – he also expressed his hopes and dreams for NASA's future and the future of today's youth.

"Everyone needs to find their one passion in life," Hickam urged, "even if that means turning off all negativity. Turn off the local news broadcast. Turn off your parents if you need to!"

He also made two interesting points on NASA's future. First, a revolutionary new propulsion system is necessary for the next human space flight breakthrough. Secondly, he equated the first Antarctic expeditions and its current research stations to the early Moon expeditions during the Apollo era. Between the first explorations to the South Pole, and the establishment of the first research outposts there today, was a period of about 40 years.

"In the next ten to fifteen years, I am confident that we will have a Moon base,



Homer Hickam, Jr.

much like the complex currently in the Antarctic," Hickam said.

Hickam also discussed his involvement with the movie "October Sky," which is adapted from his book entitled "Rocket Boys." Hickam elaborated on some of the most notable variations from the book version, saying there were actually three machine shop workers that helped with the Rocket Boys experiments. Also, Homer never actually worked in the Coalwood coal mine and his father was not as harsh as the movie portrays him to be. "Be sure to look for me in the audience at the next Academy Awards," added Hickam.

Hickam grew up in Coalwood, West Virginia, as the youngest son of a coal mining supervisor. Inspired by the launch of Sputnik 1 in 1957, he led a group of friends, now called the Rocket Boys, to build and launch model rockets and went on to win the National Science Fair in Indianapolis in 1960. Now retired from his job at Marshall Space Flight Center as a scuba instructor and payload trainer, Hickam has returned to his love of writing. In addition to his current lecture circuit, he is working on his fourth book. ■

TICKET WINDOW

The following discount tickets are available at the Exchange Stores

General Cinema Theaters	\$5.50
Sony Loew's Theaters	\$5.00
AMC Theaters	\$4.75
Fiesta Texas	adult ... \$18.25 (child under 48") ... \$15.50
Astroworld one-day admission	\$21.00
Moody Gardens (2 of 6 events) (does not include Aquarium Pyramid)	\$10.75
Moody Gardens (Aquarium only)	\$9.25
Sea World	adult .. \$27.25 child (age 3-11) ... \$18.25
Space Center Houston	adult .. \$10.25 child (age 4-11) ... \$6.50
(JSC civil service employees free.)	
Space Center Houston annual pass	\$18.75

October 2 - November 14

Texas Renaissance Festival .. adult .. \$15 child .. \$6.50

Effective October 1, the JSC Exchange will accept personal checks with a valid Texas driver's license. We will no longer require a NASA badge. There will be a \$25 charge on all returned checks.

Exchange Store hours

Monday-Friday

Bldg. 3 7 a.m.-4 p.m.

Bldg. 11 9 a.m.-3 p.m.

All tickets are nonrefundable.

Metro tokens and value cards are available.

Franklin Planners now available.

For more information, please call x35350.

J S C * S S H I N I N G S T A R**Sinking to salvage: *Liberty Bell 7***

By John Ira Petty

On July 21, 1961, Marine Corps pilot Jim Lewis fought the weight of a flooded Liberty Bell 7 and impending failure of his UH-34D helicopter's engine to save the Mercury capsule. After agonizing minutes seen by millions of TV viewers, he was forced to disengage the cable.

The capsule sank in almost 16,000 feet of water northeast of the Bahamas.

In the predawn hours of July 20, 1999, that pilot, now more formally known as James L. Lewis, Ph.D., chief of the Space Human Factors Branch in Johnson Space Center's Flight Projects Division, watched Liberty Bell 7 emerge from the dark Atlantic waters. It was hoisted onto the deck of the recovery ship, *Ocean Project* owned by Oceaneering International, for return to Cape Canaveral on July 21, the 38th anniversary of its launch.

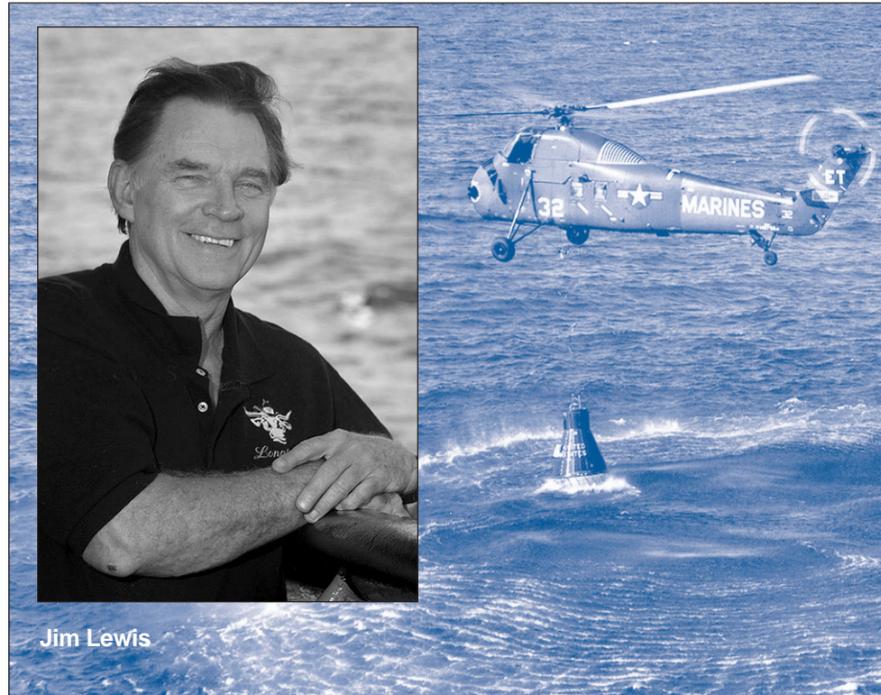
Lewis was able to land his crippled helicopter on the USS *Randolph*, and the backup helicopter recovered Grissom, whose flight suit was flooding through a hose connector.

Later, a reporter asked Lewis if that had been one of the worst days of his life. "No," I told him, "it was one of the best days of my life, because all our contingency procedures worked – all our NASA and Marine Corps training paid off."

Lewis was born in Shreveport, La., but his family moved to Houston in 1947, when he was 10. He graduated with a degree in math, physics and psychology from the University of Houston, then joined the Marine Corps. After a stint as a helicopter pilot in the Far East, he got into the Marine helicopter unit assigned to recover spacecraft.

Lewis' helicopter lifted off the deck of the carrier about the time Liberty Bell 7 was launched. The impact was close to the predicted area. Lewis and his crew saw the capsule descending under its parachutes.

Once the capsule was in the water, Lewis talked to astronaut Gus Grissom by radio. Grissom asked for about five



A U.S. Marine Corps helicopter attempts to lift the Liberty Bell 7 spacecraft from Atlantic waters. Gus Grissom was safely pulled from the water, but attempts to retrieve the spacecraft were unsuccessful and it sank to the bottom of the ocean.

minutes to finish his closeout checklist. While the helicopter was making its approach to the capsule, the capsule's hatch blew unexpectedly.

"It was almost under water when we got there," Lewis said. "I had to put the helicopter's wheels in the water" to enable the copilot to hook a cable to it.

When they were securely attached, they found themselves with a water-filled capsule that weighed about 1,500 pounds more than their helicopter could lift. They also had a "chip detector" warning light in the cockpit, indicating there were metal fragments in the helicopter's oil. Engine failure could be expected in perhaps five minutes.

Lewis ordered the copilot not to lower the hoist for Grissom, and called the backup helicopter to pick up the astronaut. Lewis' helicopter towed the capsule away to provide clearance for the backup aircraft.

They almost succeeded in getting the

capsule out of the water – Lewis had decided to remain attached to Liberty Bell 7 until he saw cylinder head temperature increase and oil pressure decrease. When that happened, he detached the cable.

After Lewis left active Marine Corps duty in September of 1961 (he remained in the Reserves until he retired as a major with 20 years service), he joined the Space Task Group. "That was the first time in my life I really knew what I wanted to do."

They sent him back to the University of Houston for a master's degree. In 1979 he earned a Ph.D. there in human factors engineering.

"Having been a pilot," he said, "I knew, like every pilot that's ever flown, that I could design a cockpit better than whoever did it. It became a mission of mine."

He's still doing that, along with looking at just about every other interaction between flight crewmembers and their hardware and software. "And the people

who do the flying still think they could design it better. They're probably right, because budget, weight and schedule constraints often compromise what pilots consider optimum design."

One fallout from his early contact with the astronauts was a stint driving Formula V racecars. He said that stopped when he and his wife Ghislaine started raising a family.

Lewis said he has loved coming to work every day of his career. "Not many people can say that. I've had great people to work with and great things to work on. It's really been a fun ride."

Married and the father of two sons, both of whom hold chemical engineering degrees from the University of Texas at Austin, Lewis enjoys skiing, golf and bowling in his spare time.

The Discovery Channel interviewed Lewis for its coverage of the Liberty Bell 7 recovery effort, and subsequently invited him aboard the recovery ship. An attempt to recover the capsule in May failed when a cable broke, resulting in the loss of a robotic submersible.

The second attempt was suspenseful. The remote submersible with its cameras had to be brought back aboard before they could begin hoisting the capsule. No one was sure the capsule was still attached to the cable during the six hours it took to reel it in.

"When it finally broke the surface, there was a lot of yelling and cheering," Lewis said. It was 2:30 a.m. and everyone had been up more than 24 hours.

Looking back, Lewis says that on the day the capsule sank, two things happened against huge odds, and they happened minutes apart. The helicopter was the best the squadron had, and the engine problem (which began right after the capsule was snagged but before the aircraft tried to lift it) was totally unexpected.

So was the hatch blowing. Lewis says he's convinced Grissom wasn't responsible for the hatch opening.

The Discovery Channel's special on Liberty Bell 7 is scheduled to air on the night of December 12. ■

Martial arts class offers new form of defense

Something different is happening on the second floor of the Gilruth Recreation Center every Tuesday and Wednesday evening. Men and women are dressed in white uniforms with cloth belts tied around their waists. Each belt is a solid color, either white, green, brown or black. They talk quietly as they ready themselves for class. They are members of the NASA Aikikai or "School of the Way of Harmony." They come together twice a week to learn the traditional Japanese martial art, Aikido (literally "the way of harmony").

The head instructor of NASA Aikikai is Leon Blum, who also works as chief of staff in the ISO 9000 Office. Blum began his martial arts training in Korea where he learned the karate style, Tae Kwan Do (or "the way of the hand and foot"). Over the years he studied different martial arts including Ju Jitsu, fencing, and Tai Chi. When his judo instructor unexpectedly had to leave to follow a job, Blum began to learn Aikido because "it was the only martial arts class which fit my schedule." Blum is a now fifth-degree black belt in Aikido and is ranked in several other martial art styles. He started teaching Aikido at the Gilruth Center in 1990.

Aikido is based on the idea that you don't have to injure your opponent to prevent him or her from hurting you.

The class does an exercise called "the walk" which takes them through a progression of increasingly complex movements.

Then students, in pairs, practice exercises that teach the concepts of balance, redirection of energy and motion, and controlling another person's force. Blum says that all of the techniques and principles can be explained in terms of sciences like physics and anatomy. "There are some styles that stress the mystery and spiritual reasons for why techniques work. Here we like to break techniques down by scientific investigation. Since many of my students are physicists, mathematicians, and engineers, it is easier to explain things according to scientific principles of gravity, leverage, and kinetics."

People always ask if Aikido works in real life, says Blum. "I tell them about two of my students. One of them is an emergency medical technician. On the job one night, a man

with a baseball bat attacked her. Even though he was twice her size, she was able to throw him to the ground, take away his bat and hold him until the police arrived, without either one of them being injured. (The man was bruised). A car hit the other student while he was riding his bicycle. As he was thrown over the car to the ground, he avoided injury by rolling out just like he was taught to fall in class. I'm just as proud of both students because they know that Aikido works "for real."

Every year, Blum also teaches hundreds of men and women during his one-hour seminars on "Women's Self-Defense." That class has been held all across Harris County to such groups as the Texas Aggie Mother's Club, B'nai Brith Women, United Space Alliance and at Total Safety and Health Day. Blum teaches the class for free to stress the strategies of defense rather than the physical aspects that he teaches in his regular class. "If you are prepared for what the criminal is going to do, you are better able to avoid becoming a victim," says Blum. ■



Instructor Leon Blum demonstrates Aikido technique to students.

NASA JSC Photo S99-11093 by Bill Stafford

GILRUTH CENTER NEWS<http://www4.jsc.nasa.gov/ah/exceaa/Gilruth/Gilruth.htm>

Hours: The Gilruth Center is open from 6:30 a.m.-10 p.m. Monday-Thursday, 6:30 a.m.-9 p.m. Friday, and 9 a.m.-2 p.m. Saturday. Contact the Gilruth Center at (281) 483-3345.

Sign up policy: All classes and athletic activities are on a first-come, first-served basis. Sign up in person at the Gilruth Center and show a yellow Gilruth or weight room badge. Classes tend to fill up two weeks in advance. Payment must be made in full, cash or by check, at the time of registration. No registration will be taken by telephone. For more information, call x33345.

Gilruth badges: Required for use of the Gilruth Center. Employees, spouses, eligible dependents, NASA retirees and spouses may apply for photo identification badges from 7:30 a.m.-9 p.m. Monday-Friday and 9 a.m.-2 p.m. Saturdays. Cost is \$10. Dependents must be between 16 and 23 years old.

Nutrition intervention program: Six-week program includes lectures, a private consultation with the dietitian and blood analysis to chart your progress. Program is open to all employees, contractors and spouses. For details call Tammie Shaw at x32980.

Defensive driving: One-day course is offered once a month at the Gilruth Center. Pre-registration required. Cost is \$25. Call for next available class.

Stamp club: Meets every second and fourth Monday at 7 p.m. in Rm. 216.

Weight safety: Required course for employees wishing to use the Gilruth weight room. Pre-registration is required. Cost is \$5. Annual weight room use fee is \$90. The cost for additional family members is \$50.

Exercise: Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays. Cost is \$24 for eight weeks.

Step/bench aerobics: Low-impact cardiovascular workout. Classes meet from 5:15-6:15 p.m. Tuesdays and Thursdays. Cost is \$32 for eight weeks. Kristen Taragzewski, instructor.

Yoga: Stretching class of low-impact exercises designed for people of all ages and abilities in a Westernized format. Meets Thursdays 5-6 p.m. Cost is \$32 for eight weeks. Call Darrell Matula, instructor, at x38520 for more information.

Ballroom dancing: Classes meet from 6:30-7:30 p.m. Thursdays for beginners, 8:30-9:30 p.m. for intermediate and 7:30-8:30 p.m. for advanced. Cost is \$60 per couple.

Country and western dancing: Beginner class meets 7-8:30 p.m. Monday. Advanced class (must know basic steps to all dances) meets 8:30-10 p.m. Monday. Cost is \$20 per couple.

Fitness program: Health-related fitness program includes a medical screening examination and a 12-week individually prescribed exercise program. For more information call Larry Wier at x30301.

Aikido: Martial arts class for men and women meets 5 - 6 p.m. Tuesdays and Wednesdays. No special equipment or knowledge is needed to participate. Aikido teaches balance and control to defend against an opponent without using strength or force. Beginning and advanced classes start each month. Cost is \$35 per month.

DATES & DATA**October 25**

Alzheimer's support group meets: The Clear Lake Alzheimer's Caregiver Support Group will meet at 7:30 p.m. to 9 p.m. October 25 in the first floor conference room, St. John Hospital West building, Nassau Bay. For more information, contact Nancy Malley at (281) 480-8917 or John Gouveia (281) 280-8517.

October 27

Astronomy seminar: The JSC Astronomy Seminar Club will meet at noon October 27 and November 3 and 10 in Bldg. 31, Rm. 248A. For details call Al Jackson at x35037.

Spaceland Toastmasters meet: The Spaceland Toastmasters will meet at 7 a.m. October 27 and November 3 and 10 at the House of Prayer Lutheran Church. For additional information, call George Salazar at x30162.

Spaceteam Toastmasters meet: The Spaceteam Toastmasters will meet at 11:30 a.m. October 27 and November 3 and 10 at United Space Alliance, 600 Gemini. For additional information call Patricia Blackwell at (281) 280-6863.

October 28

Communicators meet: The Clear Lake Communicators, a Toastmasters club, will meet at 11:30 a.m. October 28 and November 4 and 11 at Freeman Library, 16602 Diana Lane. For more information, call Allen Prescott at (281) 282-3281 or Mark Caronna at (281) 282-4306.

Radio Club meets: The JSC Amateur Radio Club will meet at 6:30 p.m. October 28 at the Piccadilly, 2465 Bay Area Blvd. For more information, call Larry Dietrich at x39198.

October 29

Fall festival: Seabrook's Ed White Memorial Youth Center

hosts its annual community Fall Festival on Friday, October 29 from 6:30 p.m. to 8:30 p.m. The center is located at 1513 3rd Street in Seabrook, and will feature game booths, a creepy house, bake walk, food and face painting. Call (281) 474-2853 for more information.

October 31

Community Walk: Juvenile Diabetes Foundation's Walk to Cure Diabetes will be held at the University of Houston Clear Lake Campus October 31. Bicycling and rollerblading are permitted. Check-in begins at 8 a.m. The event starts at 9 a.m. Call Jennifer Gammill at (713) 334-4400 for registration information.

November 1

NSBE meets: The National Society of Black Engineers will meet at 6:30 p.m. November 1 at Texas Southern University, School of Technology, Rm. 316. For details, call Kimberly Topps at (281) 280-2917.

November 4

Warning System Test: The site-wide Employee Warning System will perform its monthly audio test at noon November 4. For more information, call Bob Gaffney at x34249.

November 9

Aero Club meets: The Bay Area Aero Club will meet at 7 p.m. November 9 at the Houston Gulf Airport clubhouse at 2750 FM 1266 in League City. For more information call Larry Hendrickson at x32050.

CLA-NSS meets: The Clear Lake Area chapter of the National Space Society will meet at 6:30 p.m. November 9 at the Freeman Memorial Branch Library, 16602 Diana Lane. For more information call Murray Clark at (281) 367-2227.

NASA BRIEFS**NASA TECHNOLOGY MAY HELP VICTIMS OF DIABETES**

Some American diabetics may soon be using NASA virtual-reality technology to peer inside the human body and manage the effects of the disease.

Preliminary observations show that artificial-vision technology, used to help pilots train to fly in poor visibility, helps diabetics at risk for nerve damage visualize and control blood flow to the arms and legs.

In studies this fall, patients will use "biofeedback" – self-control techniques, including changes in breathing and muscle flexing – to increase their blood flow, which will be measured through sensors attached to their fingertips. The system will use skin-surface pulse and temperature measurements to create a computer-generated image of what is actually happening to blood vessels under the skin. Just as pilots use artificial vision to "see" into bad weather, patients will use this virtual reality device to "see" beneath their skin.

The graphics technologies used in the study have been used in cockpit artificial-vision systems to help pilots see in low- or no-visibility situations, and to help designers study air-flow patterns around new aircraft shapes. In this fall's studies, diabetes patients will wear a 3-D virtual-reality headset to "see" the contraction and expansion of their own blood vessels.

BRAIN CANCER SURGERIES SUCCESSFUL USING SPACE-AGE PROBES

Surgeons have used a special lighting technology, developed by a Wisconsin company to conduct plant research in space, in two successful operations to treat brain cancer on Earth.

"A young woman operated on in May has fully recovered with no complications and no evidence of the tumor coming back," said Dr. Harry Whelan, a pediatric neurologist at the Medical College of Wisconsin in Milwaukee. "A young man who underwent surgery in August is still recovering, but everything looks great, and thus far there is no evidence of the tumor reoccurring."

For the treatment technique, a surgeon uses tiny pinhead-size Light Emitting Diodes – a source releasing long light waves – to activate light-sensitive, tumor-treating drugs.

To ensure other promising LED medical applications are investigated, NASA recently selected a Phase II Small Business Innovation Research proposal for negotiation with Quantum Devices Inc., Barneveld, WI, the company that developed LEDs for commercial plant-growth investigations on the space shuttle.

"NASA was pleased to fund the first phase of the research leading to these two successful surgeries," said Helen Stinson, manager of the Small Business Innovative Research program, which awarded the grant. The program is part of NASA's Technology Transfer Department at the Marshall Space Flight Center. "We're happy to fund Quantum as it continues to explore cutting-edge medical uses for the LEDs."

SPACE CENTER Roundup

The Roundup is an official publication of the National Aeronautics and Space Administration, Johnson Space Center, Houston, Texas, and is published by the Public Affairs Office for all space center employees. The Roundup office is in Bldg. 2, Rm. 181. The mail code is AP3. The main telephone number is x38648, and the fax is x32000. Electronic mail messages may be directed to:

EditorWilliam Jeffswilliam.p.jeffs@jsc.nasa.gov
Assistant EditorNicole Cloutierncloutie@ems.jsc.nasa.gov

**PRSR STD
U.S. POSTAGE
PAID**

WEBSTER, TX
Permit No. G27